

Abstract

The expansion of a population of stem cells or progenitor cells, or precursors thereof, may be accomplished by disrupting or inhibiting p21^{cip1/waf1} and/or p27, cyclin dependent kinase inhibitors. In the absence of p27 activity, progenitor cells move into the cell cycle and proliferate; whereas in the absence of p21 activity, stem cells move into the cell cycle and proliferate without losing their pluripotentiality (*i.e.*, their ability to differentiate into the various cell lines found in the blood stream). Any type of stem cell or progenitor cell, or precursor thereof, including, but not limited to, hematopoietic, gastrointestinal, lung, neural, skin, muscle, cardiac muscle, renal, mesenchymal, embryonic, fetal, or liver cell may be used in accordance with the invention. The present invention provides a method of expanding a cell population, cells with decreased p27 and/or p21 activity, transgenic animals with a disrupted p27 and/or p21 gene, pharmaceutical compositions comprising the cells of the invention, and methods of using these cells in gene therapy (*e.g.*, stem cell gene therapy) and bone marrow transplantation.